



**RouterOS bridge/switch configuration changes  
and possibilities in latest RouterOS versions?**



AccessPoint

Budapest, Hungary May 31, 2019

# About Me

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- Péter Major
- AccessPoint Kft.
- Using MikroTik for 9 years
- IgniteNet, Cambium and Ubiquiti trainer
- More test videos in AccessPoint Kft. YouTube channel

# About Company

- AccessPoint Kft
- Started in 2002
- One of the biggest Wireless equipment distributor
- We deals in:
  - Wire and Wireless network devices
  - Passive networks (Fibrain, etc.)
  - Trainings

# About Presentation

- What is the typical problems with CRS?
- What happened to the master-port?
- Switch vs Bridge with VLANs
- LACP
- DHCP Snooping

# Informations from partners




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Who have used MikroTik Switches?

Who love MikroTik Switches?

What is the problem with MikroTik Switches?

# Problems with MikroTik Switches?

- Slow throughput 
- Programming is hard 
- Unstable operation 
- **If you set it properly, you won't any problem!**

# Let's see some typical problems

- Configuration
- Device selection
- Measurement method
- Configuration

Configuration

Configuration

Configuration

Configuration

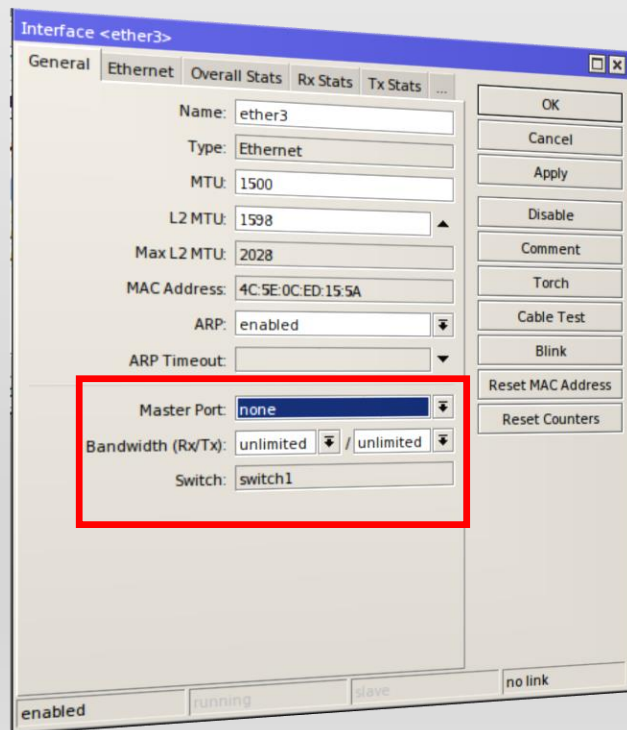
Configurati

Configurat

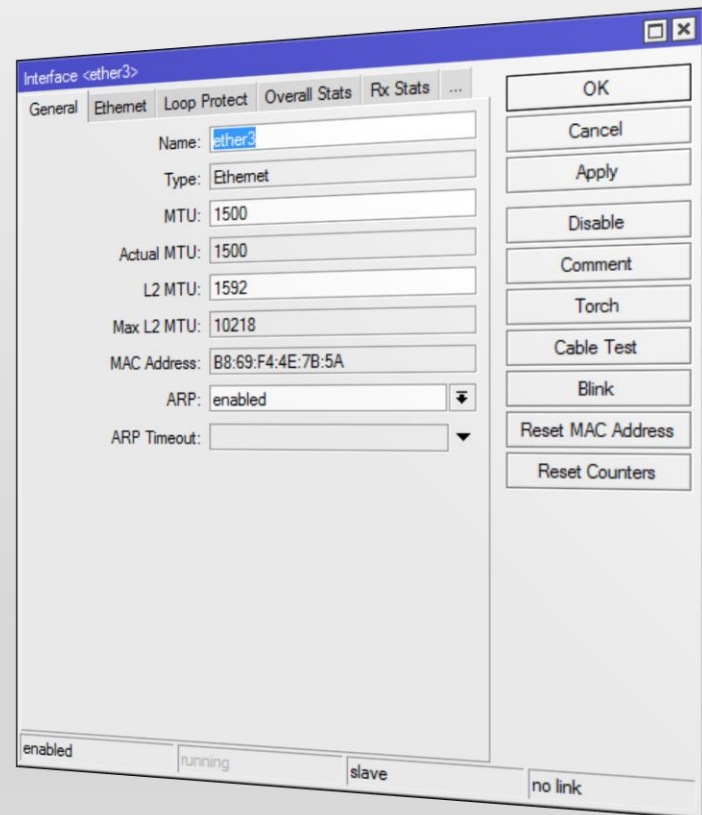
Configuratio

# What was the Master-port?

Before 6.4I ROS



After 6.4I ROS





# So we can't switch?

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- You can!
- Actually it's easier then ever!
- Only put the Interfaces to the Bridge

# So how we can switch?

The screenshot displays a network management interface. On the left, a table lists bridge ports. On the right, a detailed configuration window for 'ether19' is open, showing various settings and a 'Hardware Offload' checkbox that is highlighted in yellow.

#	Interface	Bridge	Hw. Offload
0	ether1	bridge	switch1
1	ether2	bridge	switch1
2	ether3	bridge	switch1
3	ether4	bridge	switch1
4	ether5	bridge	switch1
5	ether6	bridge	switch1
6	ether7	bridge	switch1
7	ether8	bridge	switch1
8	ether9	bridge	switch1
9	ether10	bridge	switch1
10	ether11	bridge	switch1
11	ether12	bridge	switch1
12	ether13	bridge	switch1
13	ether14	bridge	switch1
14	ether15	bridge	switch1
15	ether16	bridge	switch1
16	ether17	bridge	switch1
17	ether18	bridge	switch1
18	ether19	bridge	switch1
19	ether20	bridge	switch1
20	ether21	bridge	switch1

**Bridge Port <ether19>**

General | STP | VLAN | Status

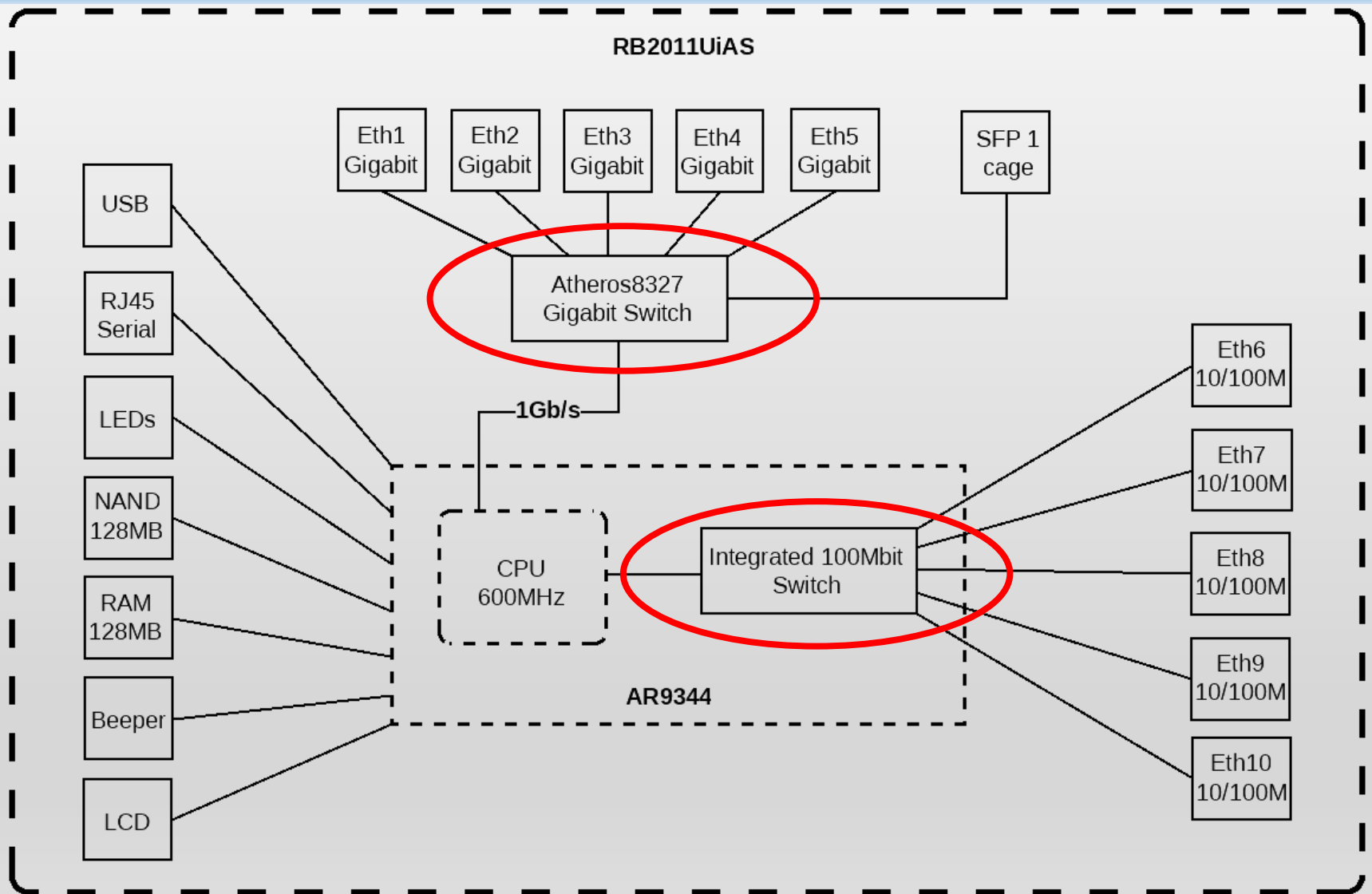
Interface: ether19  
Bridge: bridge  
Horizon: [dropdown]  
Learn: auto

- Unknown Unicast Flood
- Unknown Multicast Flood
- Broadcast Flood
- Hardware Offload**

Buttons: OK, Cancel, Apply, Disable, Comment, Copy, Remove

Footer: enabled | inactive | Hw. Offload

# How it works?



# Does it work with my RouterBOARD?

- [https://wiki.mikrotik.com/wiki/Manual:Switch\\_Chip\\_Features](https://wiki.mikrotik.com/wiki/Manual:Switch_Chip_Features)

<b>RB1100AH</b>	Atheros8327 (ether1-ether5); Atheros8327 (ether6-ether10)
<b>RB1100AHx2</b>	Atheros8327 (ether1-ether5); Atheros8327 (ether6-ether10)
<b>CCR1009 series</b>	Atheros8327 (ether1-ether4)
<b>RB493G</b>	Atheros8316 (ether1+ether6-ether9); Atheros8316 (ether2-ether5)
<b>RB435G</b>	Atheros8316 (ether1-ether3) with ether1 optional <a href="#">[more]</a>
<b>RB450G</b>	Atheros8316 (ether1-ether5) with ether1 optional <a href="#">[more]</a>
<b>RB450Gx4</b>	Atheros8327 (ether1-ether5)
<b>RB433GL</b>	Atheros8327 (ether1-ether3)
<b>RB750G</b>	Atheros8316 (ether1-ether5)
<b>RB1200</b>	Atheros8316 (ether1-ether5)
<b>RB1100</b>	Atheros8316 (ether1-ether5); Atheros8316 (ether6-ether10)
<b>DISC Lite5</b>	Atheros8227 (ether1)

etc...

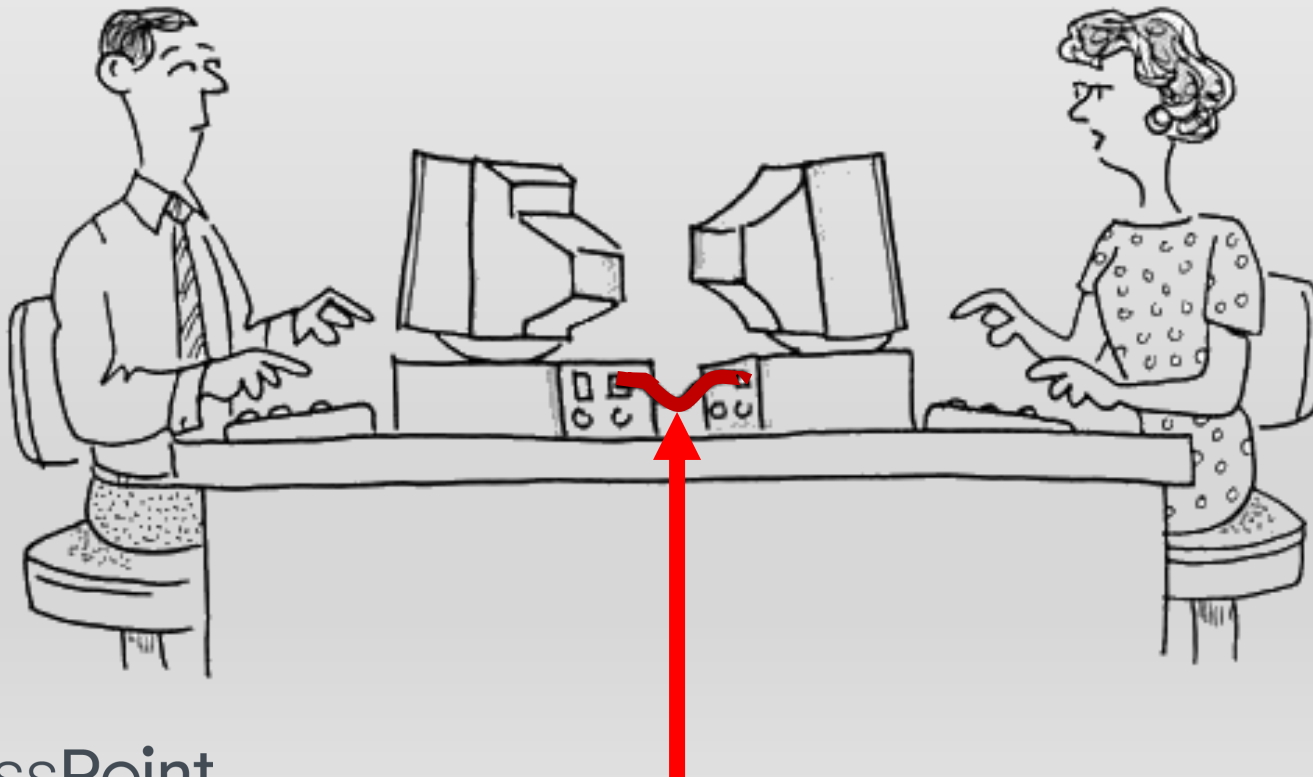
# It can only switch?

- Come on! It is a MikroTik!
- It could be STP, RSTP, MSTP, IGMP Snooping, DHCP Snooping, VLAN Filtering, Bonding with very low CPU load

RouterBoard/[Switch Chip] Model	Features in Switch menu	Bridge STP/RSTP	Bridge MSTP	Bridge IGMP Snooping	Bridge DHCP Snooping	Bridge VLAN Filtering	Bonding
CRS3xx series	+	+	+	+	+	+	+
CRS1xx/CRS2xx series	+	+	-	+1	+1	-	-
[QCA8337]	+	+	-	-	+2	-	-
[Atheros8327]	+	+	-	-	+2	-	-
[Atheros8227]	+	+	-	-	-	-	-
[Atheros8316]	+	+	-	-	+2	-	-
[Atheros7240]	+	+	-	-	-	-	-
[MT7621]	+	-	-	-	-	-	-
[RTL8367]	+	-	-	-	-	-	-
[ICPlus175D]	+	-	-	-	-	-	-

# What is the VLAN?

**VLAN**  
VERY LOCAL AREA NETWORK



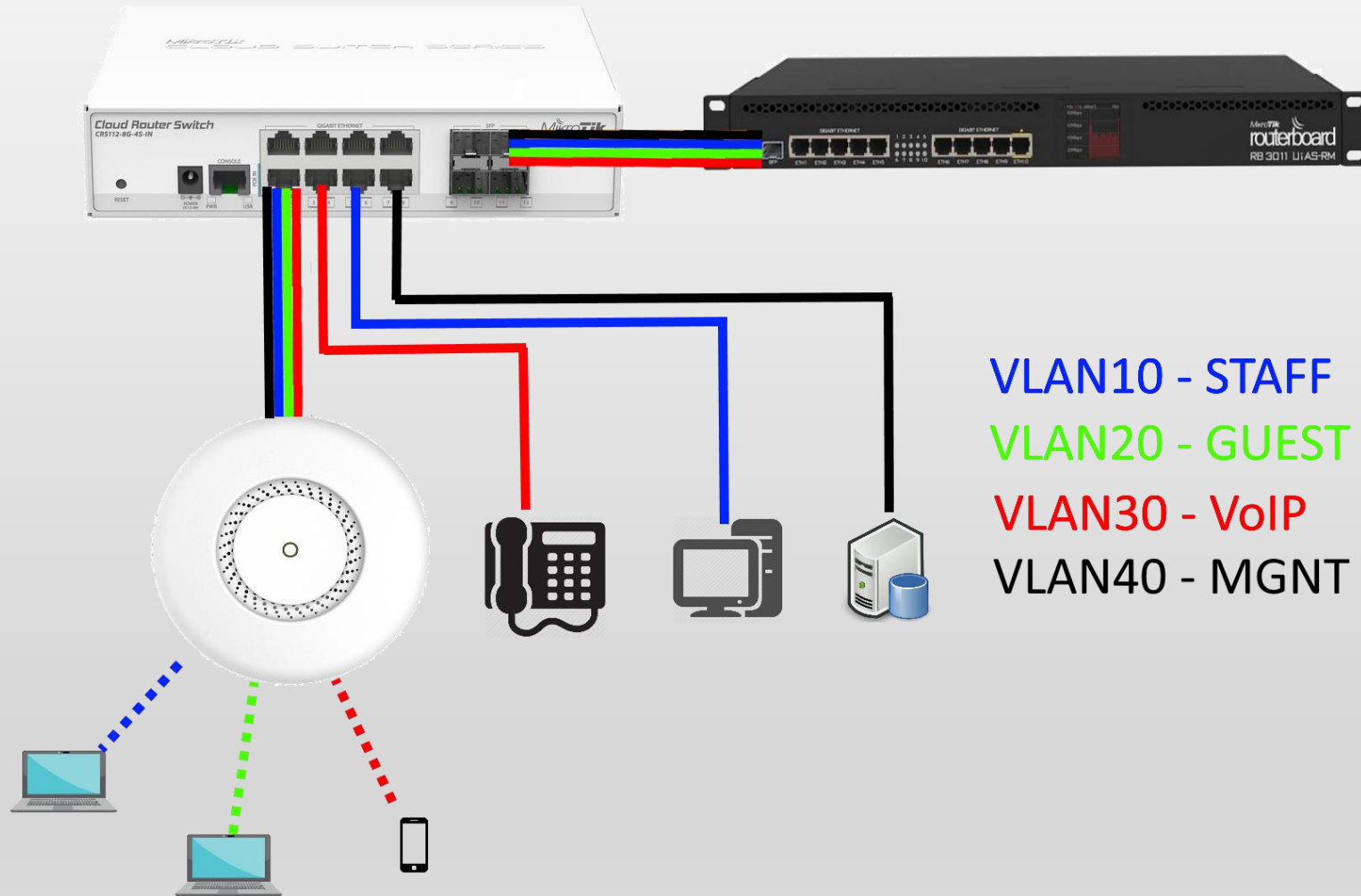
# What is the VLAN?

- What is the VLAN?
  - IEEE 802.1Q
  - 4 extra bytes

Preamble	Destination MAC address	Source MAC address	Type	PayLoad	CRC/FCS
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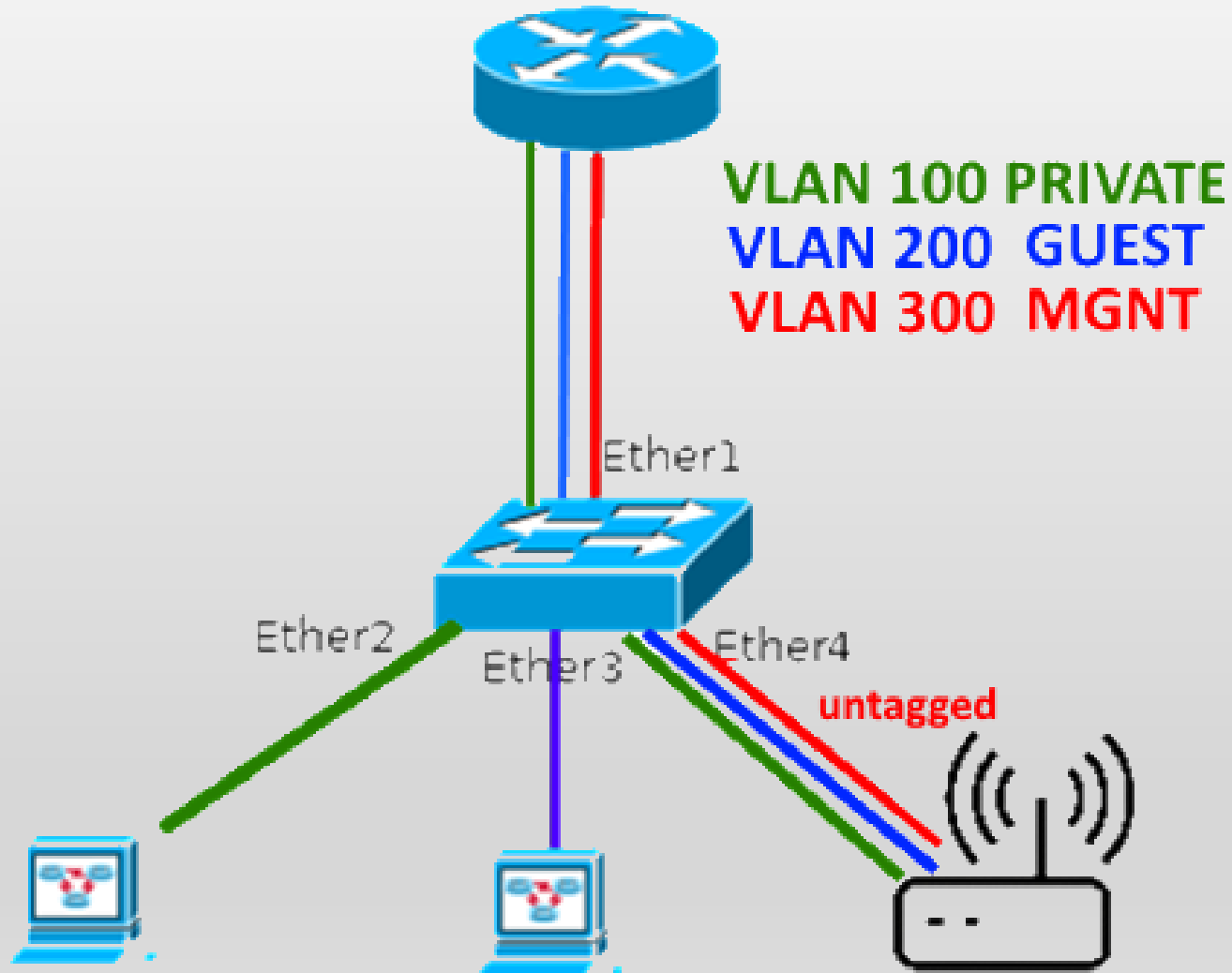
Preamble	Destination MAC address	Source MAC address	<b>802.1Q header (VLAN ID)</b>	Type	PayLoad	Recalculated field CRC/FCS
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# How I use the VLANs?





# Let's see some examples



# Let's see a wrong example

```
/interface vlan
```

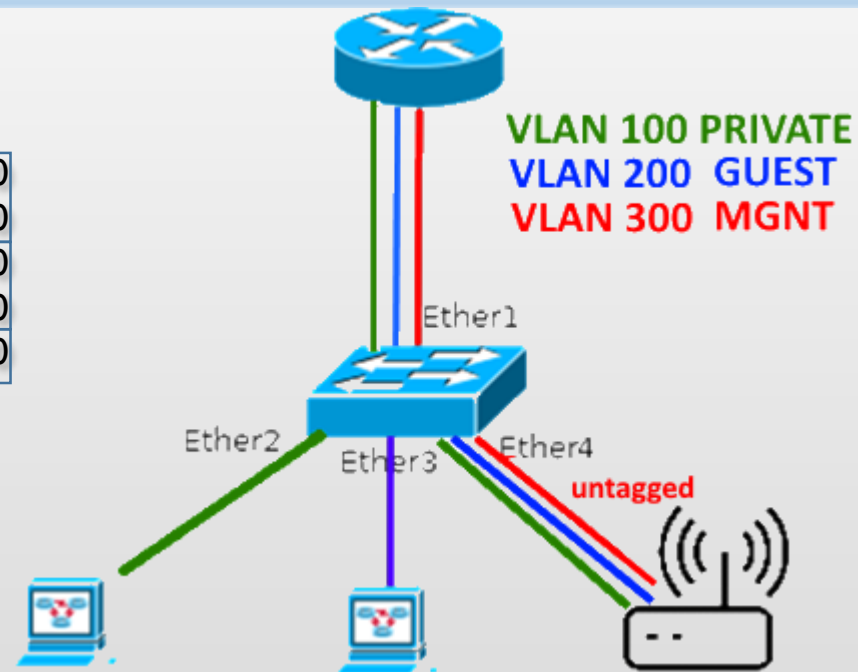
```
add interface=ether1 name="vlan100 - ETH1" vlan-id=100  
add interface=ether4 name="vlan100 - ETH4" vlan-id=100  
add interface=ether1 name="vlan200 - ETH1" vlan-id=200  
add interface=ether4 name="vlan200 - ETH4" vlan-id=200  
add interface=ether1 name="vlan300 - ETH1" vlan-id=300
```

```
/interface bridge
```

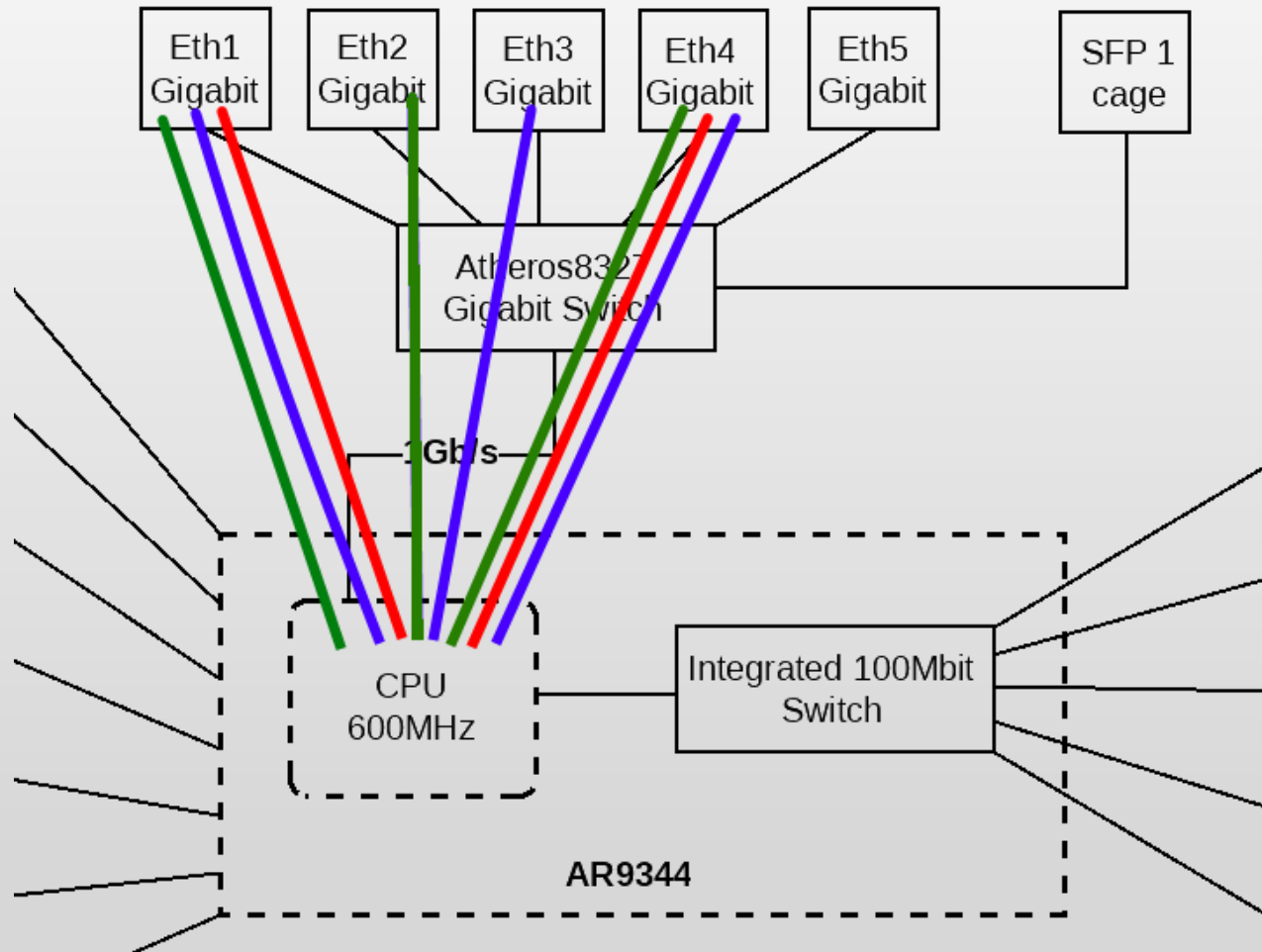
```
add fast-forward=no name="bridge - VLAN100"  
add fast-forward=no name="bridge - VLAN200"  
add fast-forward=no name="bridge - VLAN300"
```

```
/interface bridge port
```

```
add bridge="bridge - VLAN100" interface="vlan100 - ETH1 "  
add bridge="bridge - VLAN100" interface=ether2  
add bridge="bridge - VLAN100" interface="vlan100 - ETH4"  
add bridge="bridge - VLAN200" interface="vlan200 - ETH1 "  
add bridge="bridge - VLAN200" interface=ether3  
add bridge="bridge - VLAN200" interface="vlan200 - ETH4"  
add bridge="bridge - VLAN300" interface="vlan300 - ETH1 "  
add bridge="bridge - VLAN300" interface=ether4
```

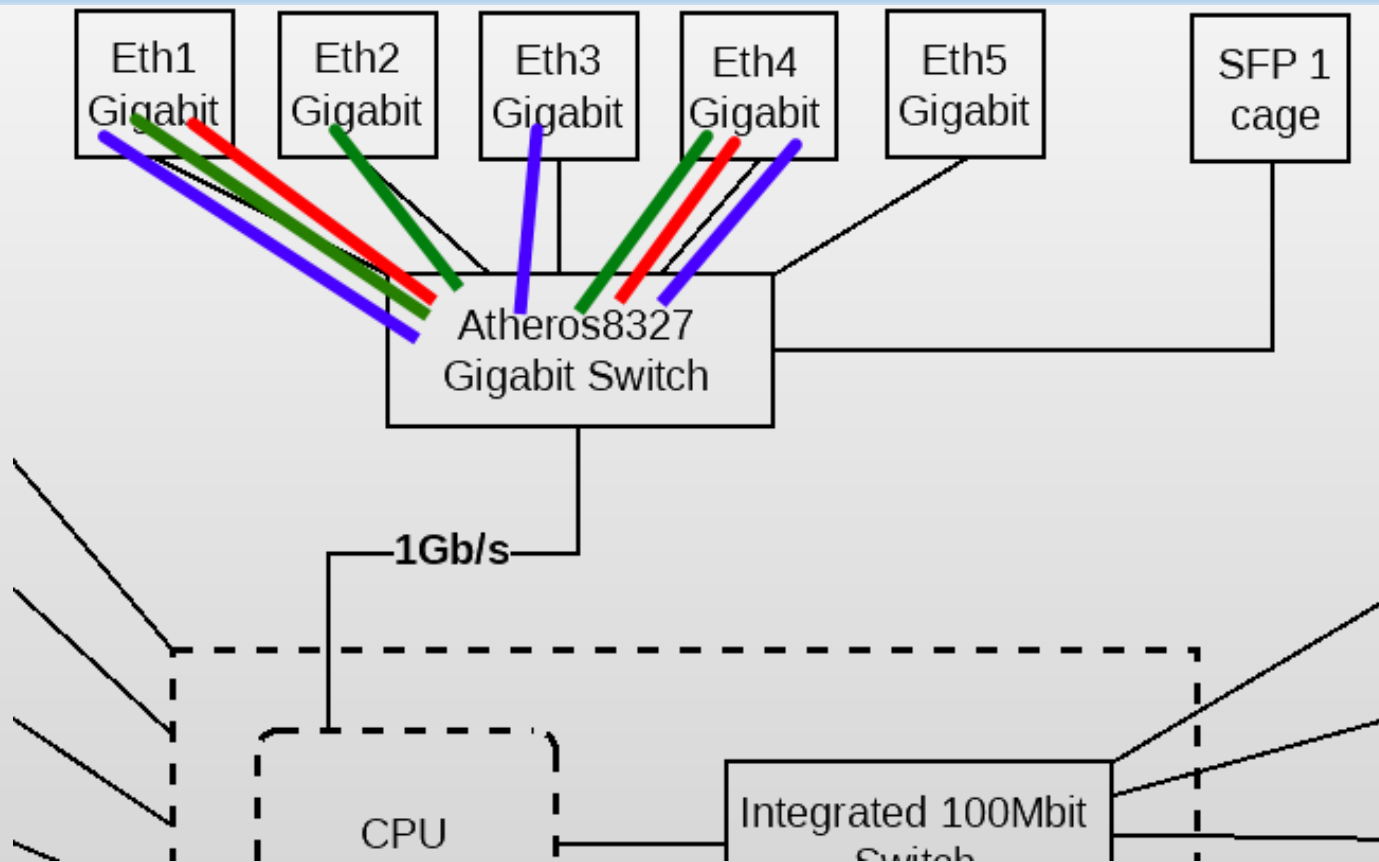


# Let's see a wrong example



Throughput: ~975Mbps with **60% CPU load**

# How can i do it correctly?



Throughput: ~995Mbps with 2% CPU load

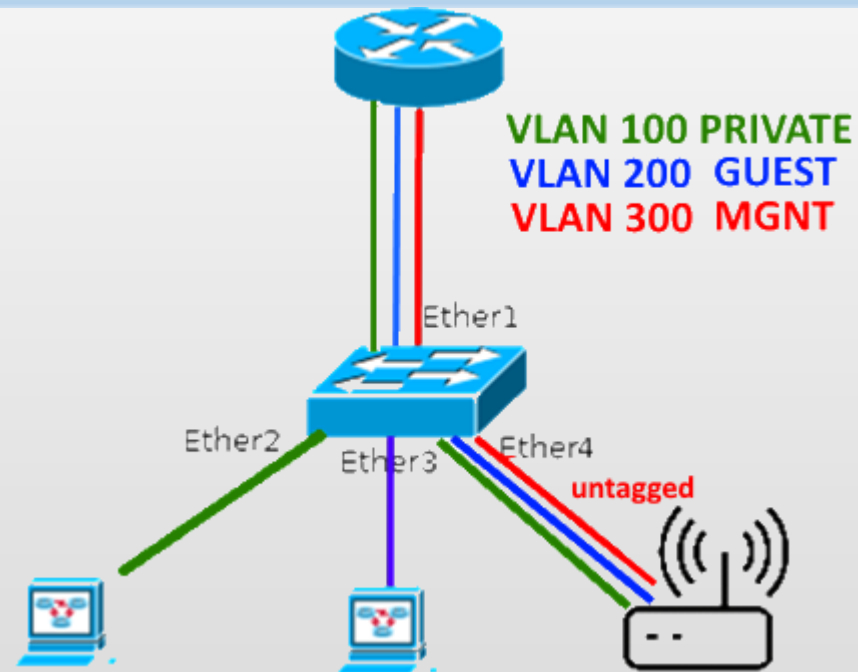
# How can i do it correctly with 2011? (Atheros8327)

## What was the difference before 6.41?

```
/interface ethernet
set ether2 master-port=ether1
set ether3 master-port=ether1
set ether4 master-port=ether1
```

```
/interface ethernet switch port
set 1 vlan-header=add-if-missing vlan-mode=secure
set 2 default-vlan-id=100 vlan-mode=secure
set 3 default-vlan-id=200 vlan-mode=secure
set 4 default-vlan-id=300 vlan-header=add-if-missing vlan-mode=secure
```

```
/interface ethernet switch vlan
add ports=ether1,ether2,ether4 switch=switch1 vlan-id=100
add ports=ether1,ether3,ether4 switch=switch1 vlan-id=200
add ports=ether1,ether4 switch=switch1 vlan-id=300
```

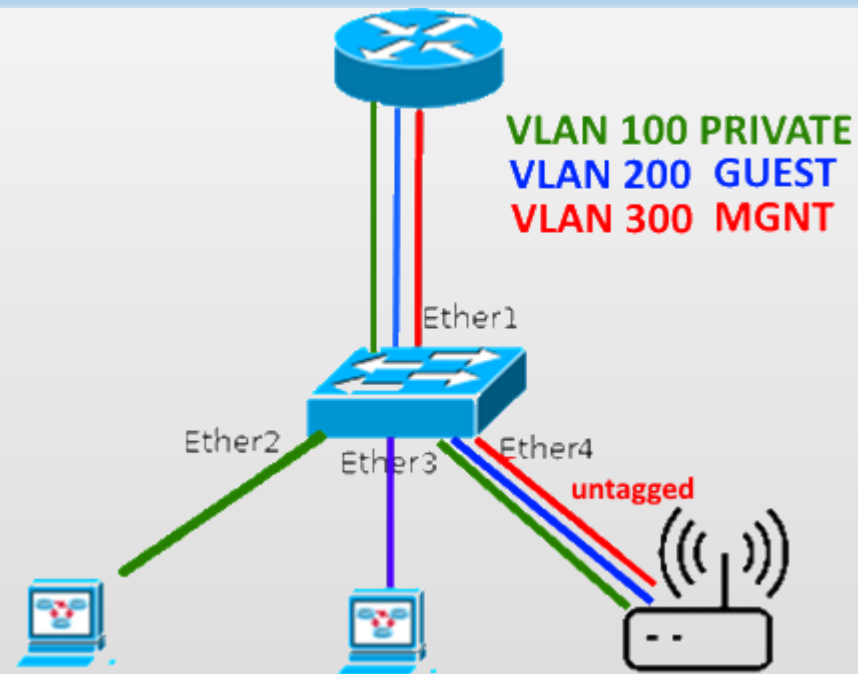


# How can i do it with 2011? (Atheros8327)

```
/interface bridge port
add bridge=bridge1 interface=ether1
add bridge=bridge1 interface=ether2
add bridge=bridge1 interface=ether3
add bridge=bridge1 interface=ether4
```

```
/interface ethernet switch port
set 1 vlan-header=add-if-missing vlan-mode=secure
set 2 default-vlan-id=100 vlan-mode=secure
set 3 default-vlan-id=200 vlan-mode=secure
set 4 default-vlan-id=300 vlan-header=add-if-missing vlan-mode=secure
```

```
/interface ethernet switch vlan
add ports=ether1,ether2,ether4 switch=switch1 vlan-id=100
add ports=ether1,ether3,ether4 switch=switch1 vlan-id=200
add ports=ether1,ether4 switch=switch1 vlan-id=300
```

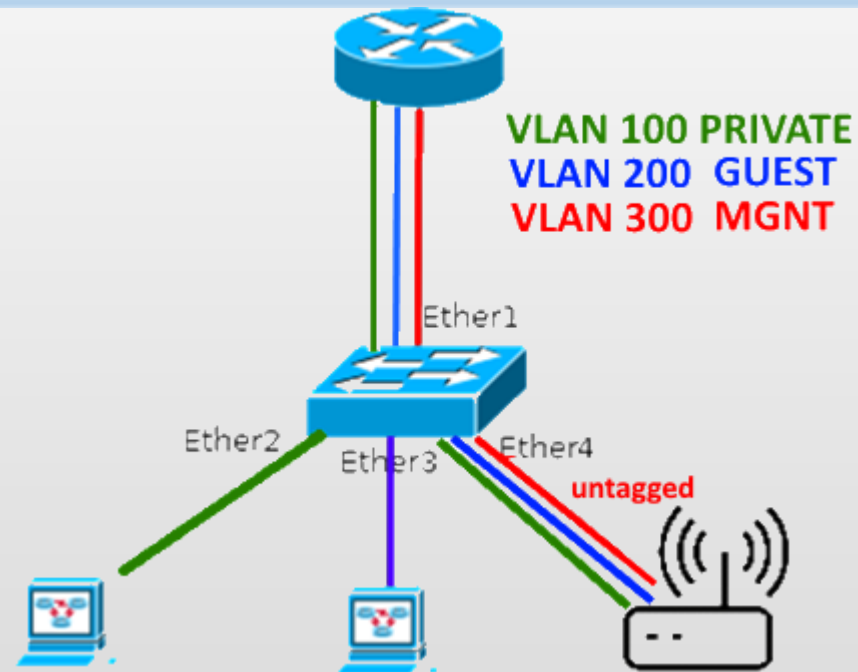


# How can i do it with CRS3XX?

```
/interface bridge
add fast-forward=no name=bridge1 vlan-filtering=yes
```

```
/interface bridge port
add bridge=bridge1 interface=ether1
add bridge=bridge1 interface=ether2 pvid=100
add bridge=bridge1 interface=ether3 pvid=200
add bridge=bridge1 interface=ether4 pvid=300
```

```
/interface bridge vlan
add bridge=bridge1 tagged=ether1,ether4 untagged=ether2 vlan-ids=100
add bridge=bridge1 tagged=ether1,ether4 untagged=ether3 vlan-ids=200
add bridge=bridge1 tagged=ether1 untagged=ether4 vlan-ids=300
```



# Conclusion

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**Misconfiguration or  
Not proper device selection  
can cause problems!**



# 1 Gigabit sometimes isn't enough

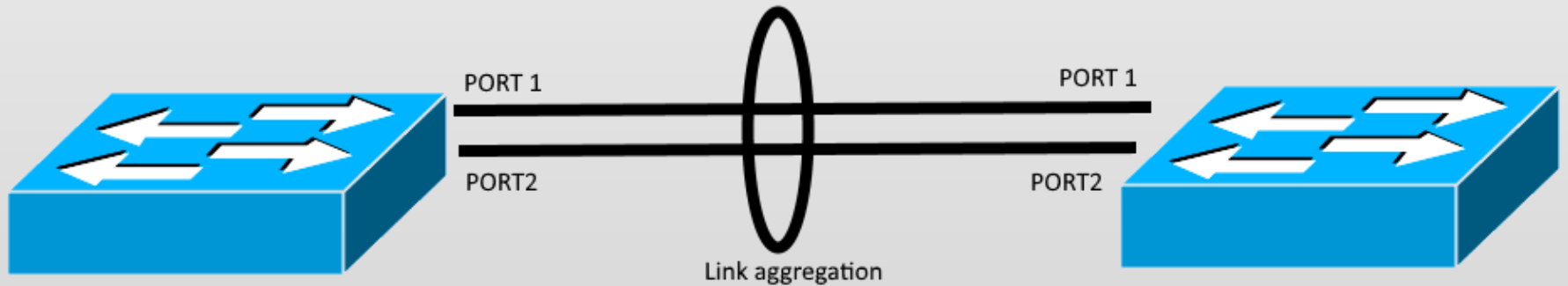
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## Possibilities?

- Use more compressed data streams \$\$\$\$
- Use 2.5G, 10G, 40G link speed \$\$
- Use Link aggregation \$

# What is the LAG?

- IEEE 802.3ad
- IEEE 802.1ax



# Is it make too high CPU load?

- Yes, could be, if you chosen a bad device

RouterBoard/[Switch Chip] Model	Features in Switch menu	Bridge STP/RSTP	Bridge MSTP	Bridge IGMP Snooping	Bridge DHCP Snooping	Bridge VLAN Filtering	Bonding
CRS3xx series	+	+	+	+	+	+	+
CRS1xx/CRS2xx series	+	+	-	+ 1	+ 1	-	-
[QCA8337]	+	+	-	-	+ 2	-	-
[Atheros8327]	+	+	-	-	+ 2	-	-
[Atheros8227]	+	+	-	-	-	-	-
[Atheros8316]	+	+	-	-	+ 2	-	-
[Atheros7240]	+	+	-	-	-	-	-
[MT7621]	+	+	-	-	-	-	-
[RTL8367]	+	+	-	-	-	-	-
[ICPlus175D]	+	+	-	-	-	-	-

The screenshot shows the Mikrotik Bridge configuration window. The 'Ports' tab is active, displaying a table of bridge ports. The table has columns for #, Interface, Bridge, Horizon, Priority (h...), Path Cost, Role, and Root Pat. The following table represents the data shown in the screenshot:

#	Interface	Bridge	Horizon	Priority (h...)	Path Cost	Role	Root Pat.
0	bonding1	bridge1		80	10	root port	10
1	ether24	bridge1		80	10	designated port	
2	ether23	bridge1		80	10	designated port	

At the bottom of the window, it says "3 items (1 selected)".

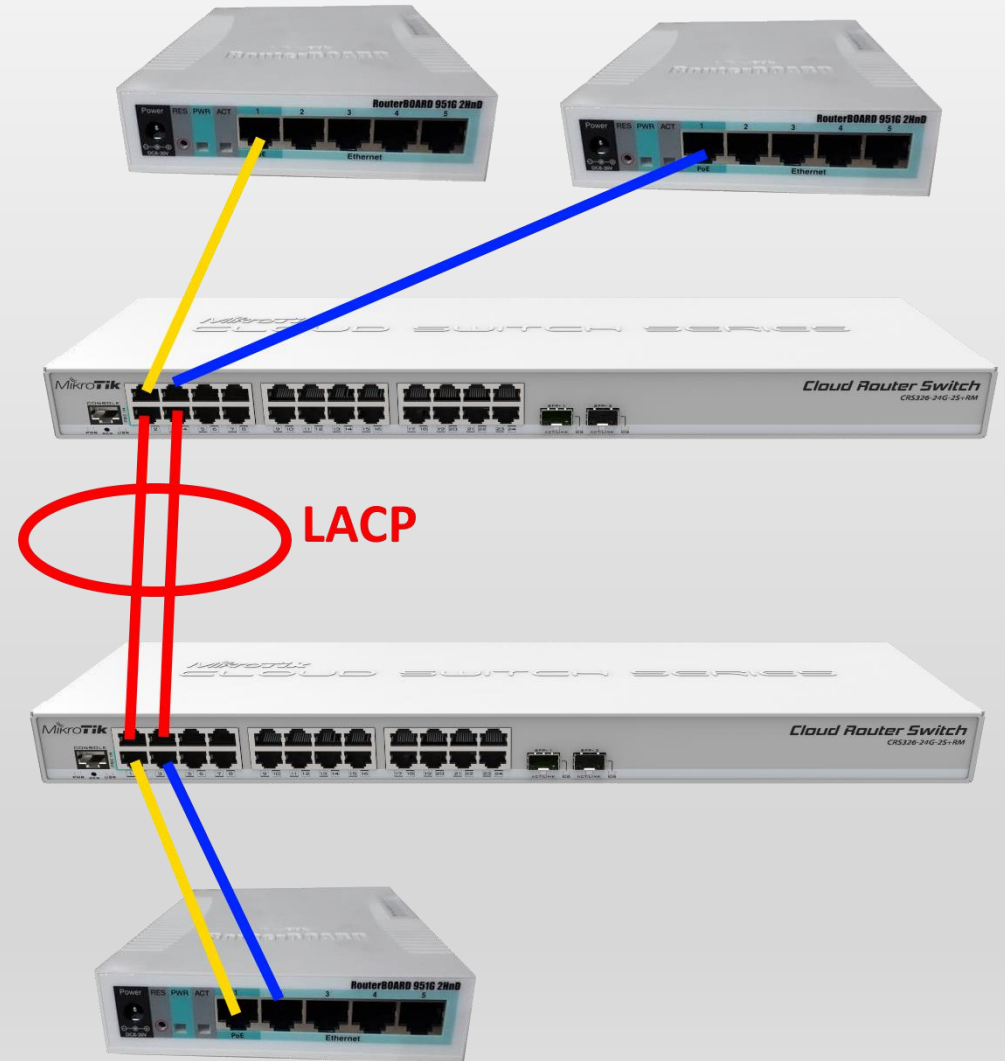
# Let's create a bonding!

The screenshot shows a network configuration window titled "Interface <bonding1>". The window has several tabs: "General", "Bonding", "Status", and "Traffic". The "Bonding" tab is selected, displaying the following configuration options:

- Slaves: ether1, ether2
- Mode: 802.3ad
- Primary: none
- Link Monitoring: mii
- Transmit Hash Policy: layer 2
- Min. Links: 0
- Down Delay: 0 ms
- Up Delay: 0 ms
- LACP Rate: 30 s
- MI I Interval: 100 ms

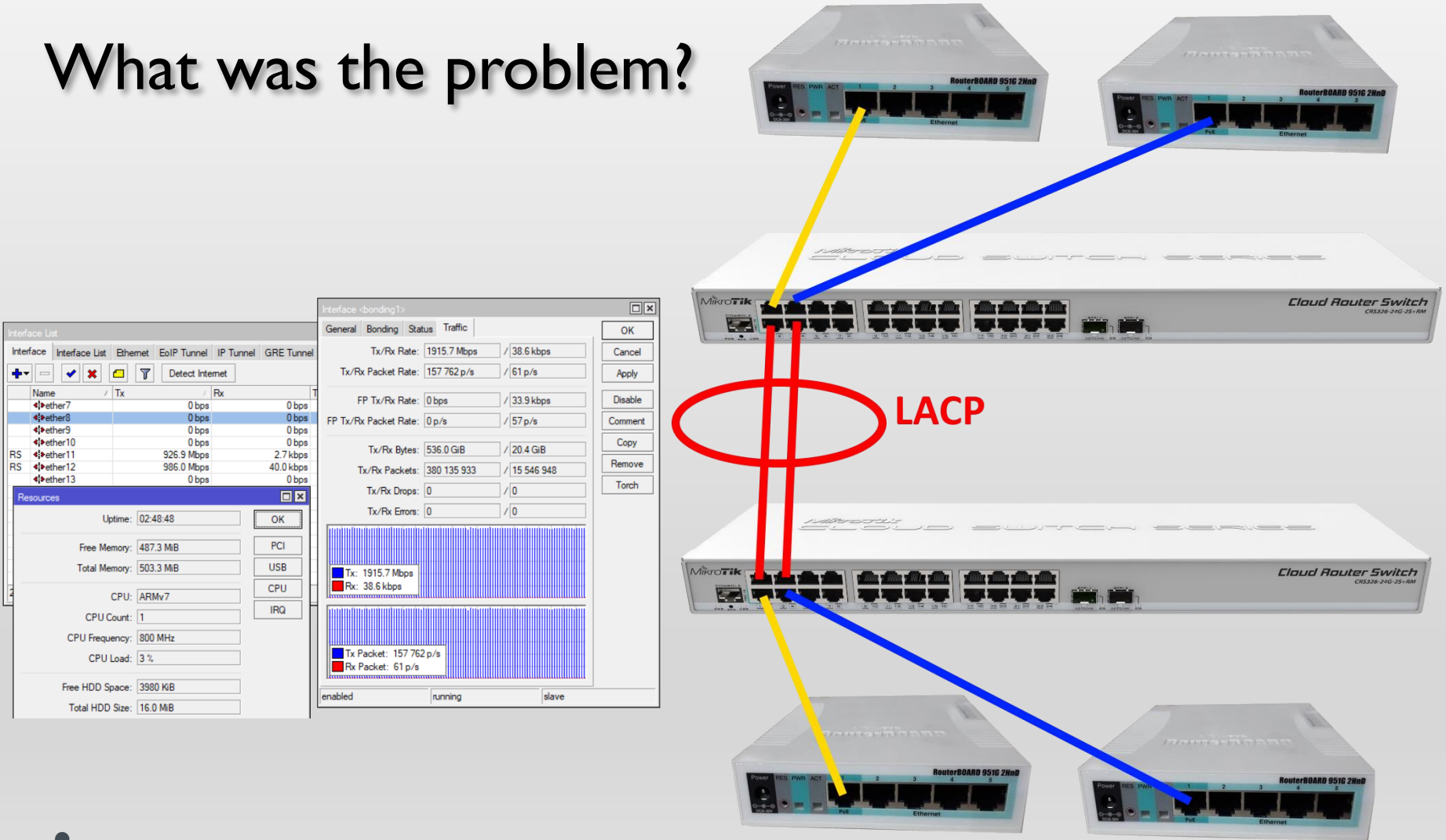
At the bottom of the window, there are three status indicators: "enabled", "running", and "slave".

# We created a bonding, but it can only IG



# Now, we have 2G

## What was the problem?



Interface List

Interface	Tx	Rx
ether7	0 bps	0 bps
ether8	0 bps	0 bps
ether9	0 bps	0 bps
ether10	0 bps	0 bps
ether11	926.9 Mbps	2.7 kbps
ether12	986.0 Mbps	40.0 kbps
ether13	0 bps	0 bps

Resources

Uptime: 02:48:48

Free Memory: 487.3 MB

Total Memory: 503.3 MB

CPU: ARmv7

CPU Count: 1

CPU Frequency: 800 MHz

CPU Load: 3 %

Free HDD Space: 3980 KiB

Total HDD Size: 16.0 MB

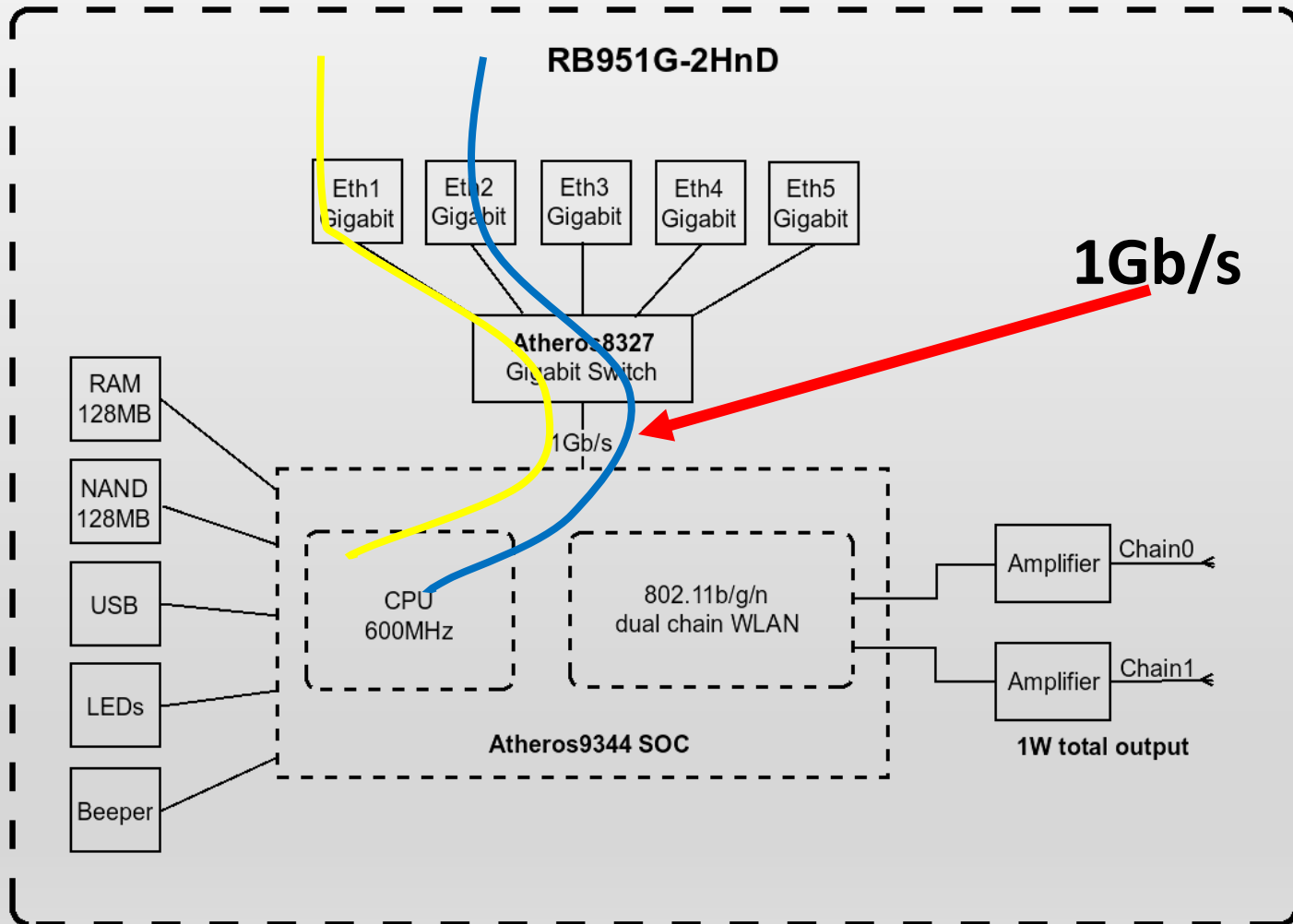
Interface <bonding1>

General	Bonding	Status	Traffic
Tx/Rx Rate:	1915.7 Mbps	/	38.6 kbps
Tx/Rx Packet Rate:	157 762 p/s	/	61 p/s
FP Tx/Rx Rate:	0 bps	/	33.9 kbps
FP Tx/Rx Packet Rate:	0 p/s	/	57 p/s
Tx/Rx Bytes:	536.0 GiB	/	20.4 GiB
Tx/Rx Packets:	380 135 933	/	15 546 948
Tx/Rx Drops:	0	/	0
Tx/Rx Errors:	0	/	0

enabled running slave



# The bottleneck was the 1Gb/s to the CPU





# Conclusion

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**Bad measurement mislead us!**

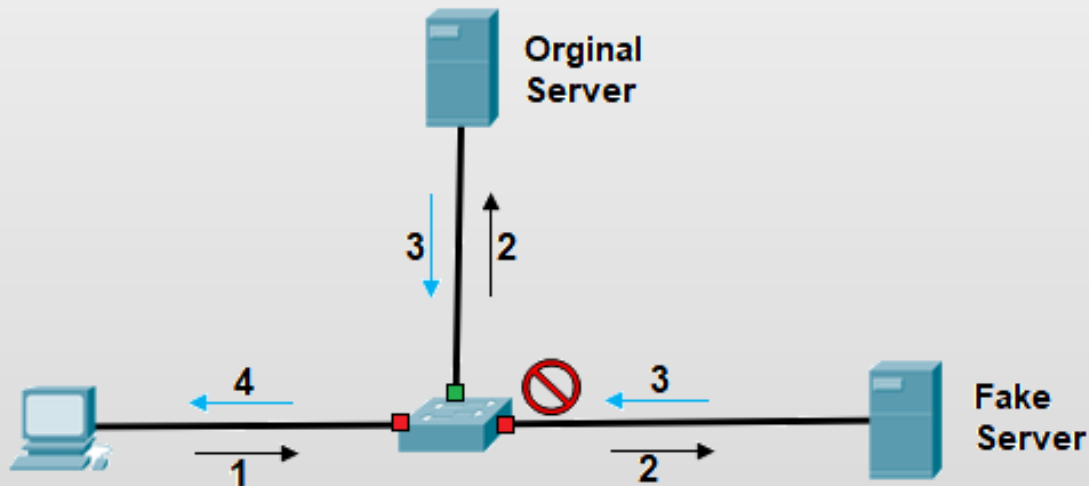
# The DHCP could be dangerous!

- Use Static IPs
- Use ARP for Leases
- Use DHCP Snooping

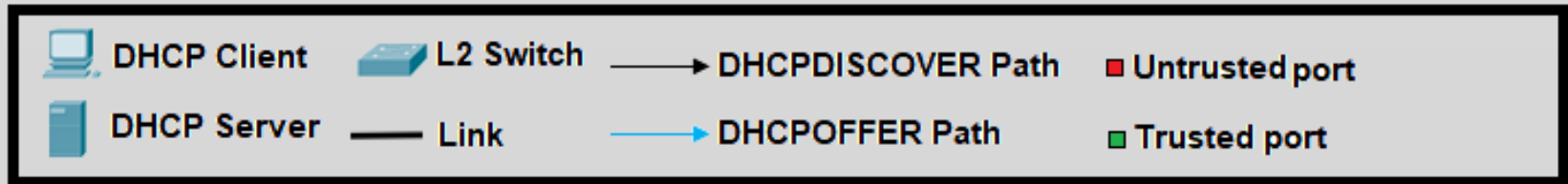


# DHCP Snooping

## - What is the DHCP Snooping?



### Legend



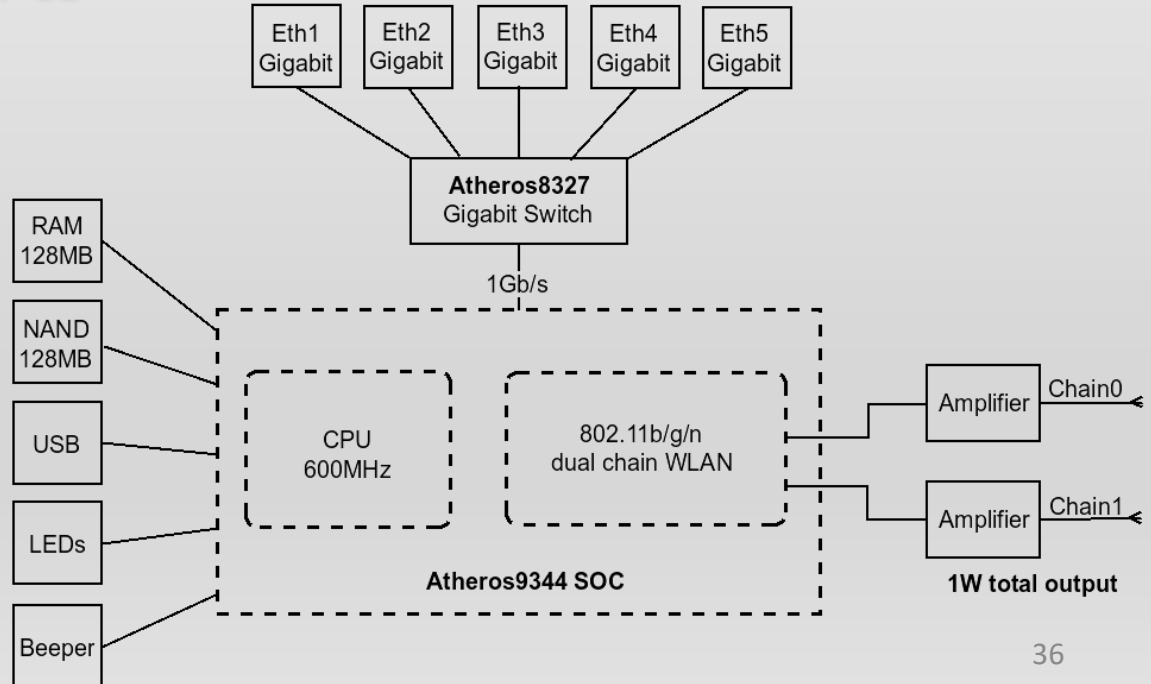
# DHCP Snooping

## - How could we do in legacy ROS?

```
/interface bridge filter
```

```
add action=accept chain=forward dst-port=67 ip-protocol=udp \  
    mac-protocol=ip out-interface=ether2 src-port=68
```

```
add action=drop chain=forward dst-port=67 ip-protocol=udp \  
    mac-protocol=ip src-port=68
```



# DHCP Snooping

## - How can we do in latest ROS (v6.43+)?

```
/interface bridge  
add dhcp-snooping=yes fast-forward=no name=bridge1
```

```
/interface bridge port  
add bridge=bridge1 interface=ether2 trusted=yes  
add bridge=bridge1 interface=ether3  
add bridge=bridge1 interface=ether4
```

The screenshot shows two configuration windows in Mikrotik WinBox. The left window is titled 'Interface <bridge1>' and has tabs for General, STP, VLAN, Status, and Traffic. Under the General tab, 'Name' is 'bridge1', 'Type' is 'Bridge', 'Actual MTU' is '1500', 'L2 MTU' is '1592', 'MAC Address' is 'B8:69:F4:4E:7B:59', 'ARP' is 'enabled', and 'Ageing Time' is '00:05:00'. At the bottom, 'DHCP Snooping' is checked and circled in red, while 'IGMP Snooping', 'Add DHCP Option 82', and 'Fast Forward' are unchecked. The right window is titled 'Bridge Port <ether2>' and has tabs for General, STP, VLAN, and Status. Under the General tab, 'Interface' is 'ether2', 'Bridge' is 'bridge1', and 'Learn' is 'auto'. The 'Trusted' checkbox is checked and circled in red. Other options like 'Unknown Unicast Flood', 'Unknown Multicast Flood', and 'Broadcast Flood' are also checked. At the bottom, 'enabled', 'inactive', and 'Hw. Offload' are visible. A status bar at the very bottom shows 'enabled', 'running', and 'slave'.

# Conclusion

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**If you have a good device, the programming is easy!**

**Work smarter, not harder!**

# Any other features?

MAC/Protocol based VLAN

Q-in-Q

Bonding

ACL rules

VLAN translation

MPLS HW Offload

Port Security

STP/RSTP/MSTP

QoS (Port, MAC, VLAN, Protocol based)

Port Isolation

Mirroring

DHCP Option 82

IGMP snooping

Traffic Storm Control



# Questions



Or you have a not public question, please send me an email to [major.peter@accesspoint.hu](mailto:major.peter@accesspoint.hu)



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**Thanks for your attention!**